Nortec®
www.humidity.com

LiveSteam
Steam Injection
Humidifiers

Installation, Maintenance, and Troubleshooting Guide

IMPORTANT: Read and save these instructions. This guide to be left with equipment owner.

Form #06-221

1506160

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INSTALLATION

RECEIVING & UNPACKING EQUIPMENT

1. Check packing slip to ensure ALL material has been delivered. Each humidifier may be shipped in more than one carton.

2. All material shortages are to be reported to Nortec within 48 hours from receipt of goods. Nortec assumes no responsibility for any material shortages beyond this period.

3. Inspect shipping boxes for damage and note on shipping waybill accordingly.

4. After unpacking inspect equipment for damage and if damage is found notify the shipper promptly.

5. All Nortec products are shipped on an F.O.B. factory basis. Any and all damage, breakage, or loss claims are to be made to the shipping company.

LOCATION OF THE HUMIDIFIER IN AN AIR CONDITIONING SYSTEM

Reference the following systems for humidifier location:

UP FLOW AFFECT

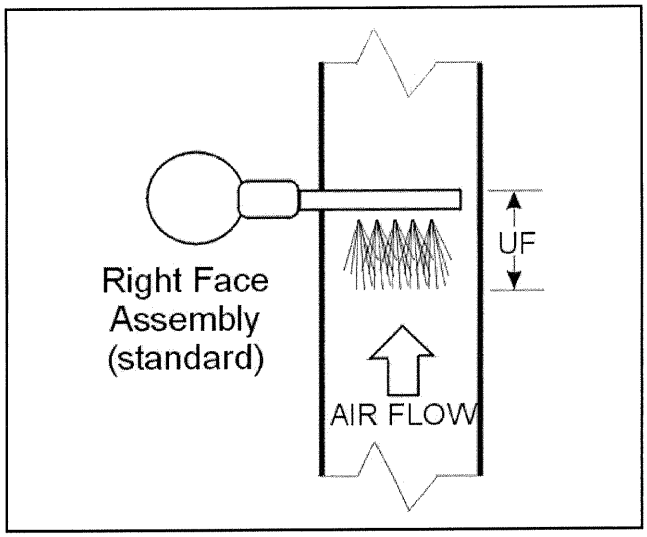
The up flow affect is a result of the air velocity versus the steam velocity leaving the orifices of the distributor. The air velocity is a product of the volume flow rate through a present cross sectional area. The steam velocity leaving the orifices is directly proportional on the internal pressure, inside the distribution tube. This pressure is reduced when two or more distributors are in use.

The following up flow guidelines has been established from testing:

Velocity	Inlet Steam Pressure	Up Flow Distance
500	15	2 ft
1000	15	1 ft
500	30	4 ft
1000	30	2 ft

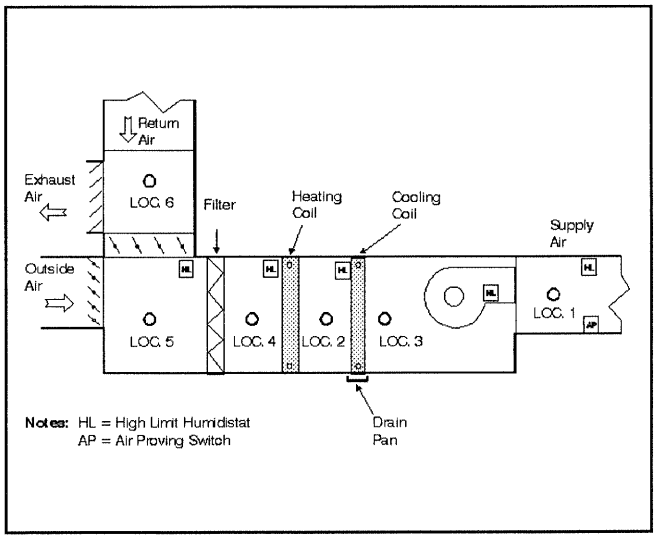
These up flow distances are only guidelines. Every application presents a multitude of variables which may shorten or lengthen the up flow distance. The location of the distributor may need to be changed if condensation occures.

Figure #1
TopView



SYSTEM 1 - AIR HANDLING UNIT

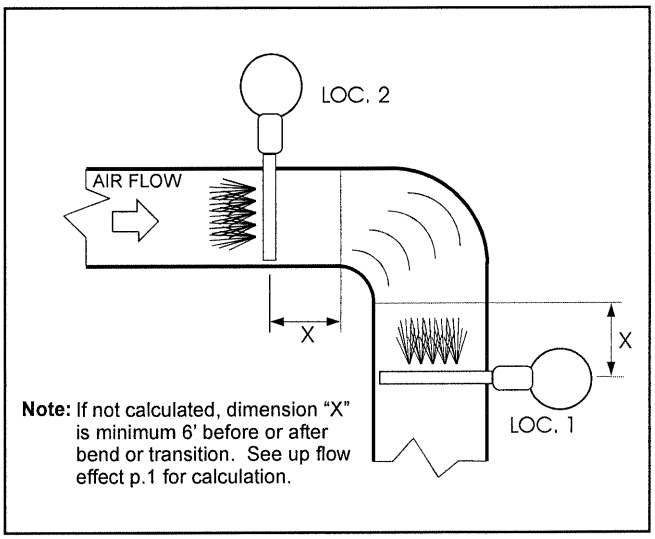
Figure #2



Location	Advantages	Disadvantages
LOC. 1	MOST recommended. Assuming there is sufficient straight duct for absorption.	High velocity may create long absorption distances.
LOC. 2	Warm air from heating coil. Good absorption will help evaporate steam.	Any unabsorbed steam may corrode coils. Possible capacity drop due to eventual condensation on the coil.
LOC. 3	Warm air. Good absorption.	If absorption distance is too long it may wet the fan.
LOC. 4	Heating coils will help evaporate steam. Air is mixed well.	Absorption may be a problem. No drain pan on coil. Cold air.
LOC. 5	Not Recommended.	Filters may get saturated. Cold air.
LOC. 6	Not Recommended.	Outside air may cause condensation problems. Problematic RH control.

SYSTEM 2 - IN DUCT NEAR AN ELBOW

Figure #3

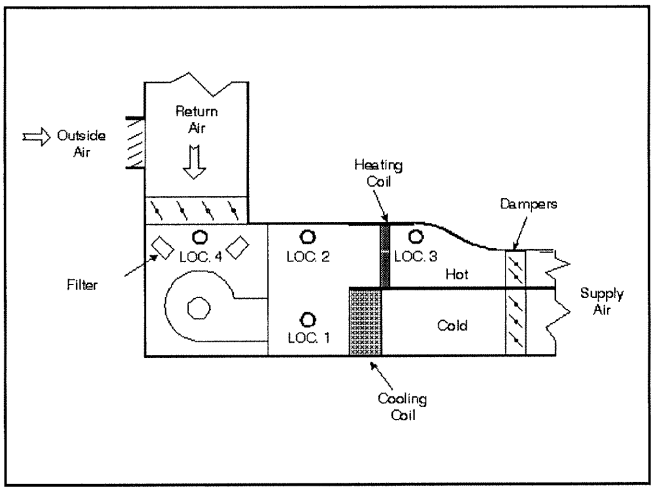

LOC. 2
AIR FLOW
X
X
LOC. 1
Note: If not calculated, dimension "X" is minimum 6' before or after bend or transition. See up flow effect p.1 for calculation.

Location	Advantages	Disadvantages
LOC. 1	Most Recommended. More air on the outside of the turn.	Uneven air flow in the duct.
LOC. 2	Even air flow over the whole duct.	Possibility of wetting of the turning vanes.

<u>WARNING:</u> This type of distributor may produce a whistling noise as the pressurized steam decompresses within the distributor and is introduced into the airstream. This noise may be increased with higher pressure applications. For noise dampening recommendations, please consult the factory.

SYSTEM 3 - MULTI-ZONE SYSTEM

Figure #4

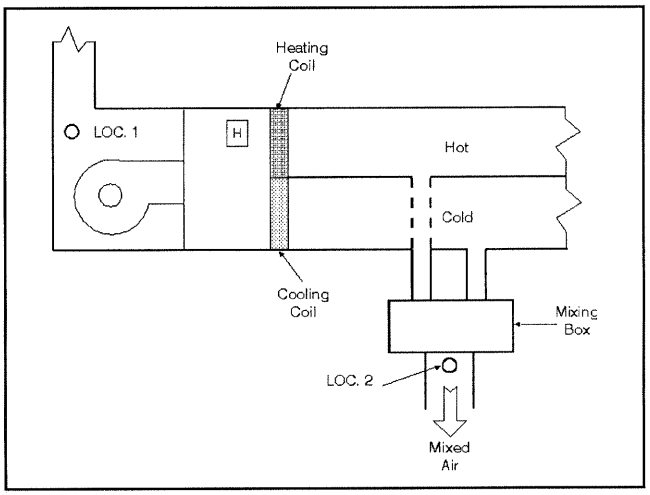


Location	Advantages	Disadvantages
LOC. 1	Maximum absorption distance to dampers.	Possible loss of capacity to condensate on cooling coils.
LOC. 2	Heating coil will help absorb steam.	Minimum distance to the dampers could result in wetting.
LOC. 3	Warm air.	Minimum distance to the dampers could result in wetting.

If one zone requires most of the air quantity supplied to the system, this zone should be the location for the humidifier. Humidity will eventually equalize when the system has been in operation for a while.

SYSTEM 4 - DUAL DUCT

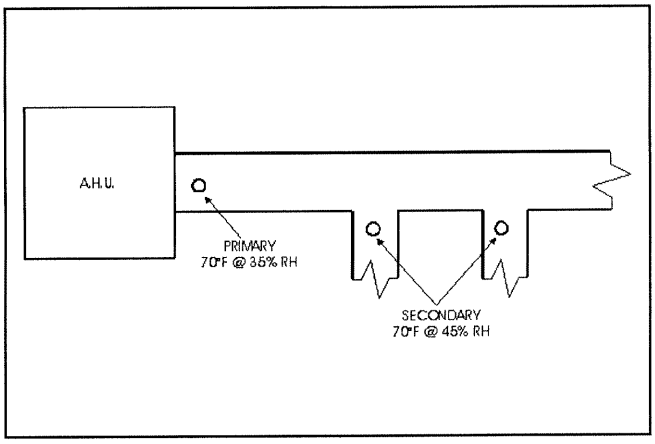
Figure #5



This system usually requires two steam distributors. The primary load (LOC.1) will go upstream of the fan. The humidistat is located after the fan and before the hot and cold decks. The secondary load (LOC.2) will go downstream to the mixing boxes and will be controlled by a humidistat in the space. Please consult your Nortec agent if absorption distance is a problem. High limit humidistat is recommended in the mixed air duct.

SYSTEM 5 - PRIMARY AND SECONDARY DISTRIBUTORS

Figure #6



On occasion you may need a secondary load to reach a higher RH level in one part of your operation (i.e. Hospitals). In this case, the primary load will maintain the normal space condition (70°F at 35% RH) and the secondary load will satisfy the higher RH level (70°F at 45% RH) needed for that zone. High limit humidistats are recommended for each duct.

STEAM AND CONDENSATE PIPING

1. Steam supply must be taken from the top of the main supply to the humidifier. Do not take from the sides or the bottom. See Figure #8.

2. For removal of condensate from the steam trap the condensate line should not be under pressure. Nortec recommends a check valve be installed after the steam trap if the condensate return line is pressurized.

3. Prpoer design and sizing of steam supply lines should be performed by a qualified firm.

ASSEMBLY OF SINGLE DISTRIBUTOR HUMIDIFIER

Note: Follow all general instructions provided with valve and actuator.

All single distributor humidifiers will be assembled at the factory if the interconnecting piping option is selected at time of order.

1. Match the separator/valve assembly with the correct distributor assembly (Nortec will tag both assemblies).

2. The o-ring in the tube adaptor should be lubricated (use silicone based lubricant).

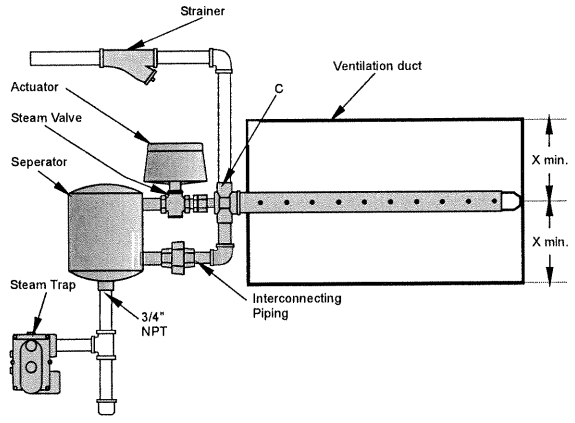
3. Slide the distributor into the tube adapter. Make sure that the o-ring is not damaged. Tighten tube adapter. The adapter should be hand tightened plus ¼ turn (25 in-lbs ± 5 in-lbs)

4. The union halves come together and are tightened to make a snug fit. The humidifier is ready to be installed in the duct. See Figure #6. Single tube comes factory assembled, multi-tube must be field assembled.

5. It is also possible to install distributor in the duct and then attach the separator/valve assembly.

6. Follow the steps listed in "Installation Of LIVESTEAM Humidifier" section to complete installation.

Figure #7



NOTES:
1. All shaded areas by NORTEC.
2. Dimension "X" is 6" for LS1 and LS2 distributors, 9" for LS3 distributors.
3. Distributors LS1-12 and LS2-12 are supplied without support bracket.
4. Interconnecting piping must be ordered at time of purchase, for factory assembly.

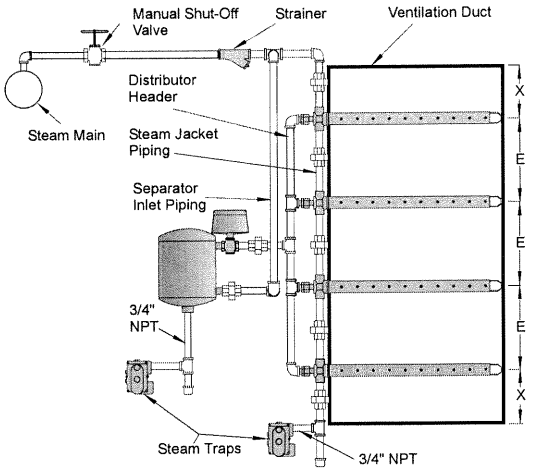
ASSEMBLY OF MULTIPLE DISTRIBUTOR HUMIDIFIER

Make a plan of distributors' layout (if not already done). See Figure #8. Multiple distributor humidifiers require field assembly. The following steps should be taken into consideration:

1. Match the separator valve assembly with the correct distributors (Nortec will tag both assemblies).

2. To ensure the same output from each dispersion tube, connect steam supply from

Figure #8



NOTES:
1. All shaded areas by NORTEC.
2. Dimension "X" is 6" for LS1 and LS2 distributors, 9" for LS3 distributors.
3. Distributors LS1-12 and LS2-12 are supplied without support bracket.
4. Interconnecting piping must be ordered at time of purchase, for factory assembly.

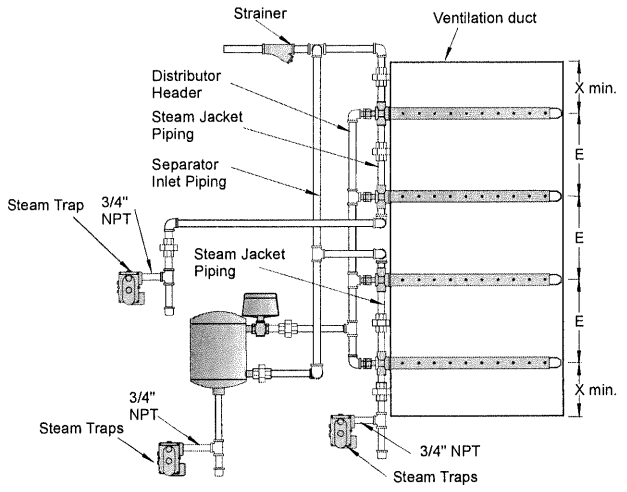
separator close to the middle of distributor header.

3. Steam jacket piping has to be secured to the distributor header to avoid possible separation. Use gear clamp or similar device.

4. Distributors have to be equally spaced in the duct. Distance to the top and bottom of the duct should be one half of "E" but not less than 6" for LS1 and LS2 distributors and not less than 9" for LS3 distributors.

5. Use additional steam trap if total length of distributors of Type LS1 exceeds 40', Type LS2 exceeds 30', and Type LS3 exceeds 20'. See Figure #9.

Figure #9



NOTES:
1. All shaded areas by AxAir NORTEC, if specified at time of order.
2.. Dimension "X" is 6" for LS1 and LS2 distributors. 9" for LS3 distributors.
3. Steam jacket piping has to be secured to distributor to avoid possible separation.

6. Follow the steps listed in "Installation Of LIVESTEAM Humidifier" section to complete installation.

INSTALLATION OF LIVESTEAM HUMIDIFIER

Note: Follow all general instructions provided with valve and actuator.

To complete installation follow the steps listed below.

1. Steam outlets of distributor should face into the air stream unless distributor is insulated. Nortec's standard is right face.

2. Distributors must be mounted level. There is a support bracket at the end of the distributor to secure to the duct wall. See Figure #11 to #14 for installation tips.

3. The steam distributor in a Single Distributor Humidifier should be centered in the duct.

4. The steam distributor should be mounted in a straight section of duct. Please consult your Nortec agent if absorption distance is a problem. For calculation of absorption distance please refer to NORTEC manual Form #163D.

5. Do not locate the steam distributor within 10 feet of high efficiency filters, otherwise the filter will become saturated.

6. Cut a hole in the side of the duct large enough to insert the steam distributor. Duct plates are provided to seal any opening.

7. Install actuator. During installation follow instructions shipped with actuator.

8. For ease of maintenance, provide shut-off a valve before humidifier (between strainer and steam main). It can also be used to minimize heat gains during the non-humidification period.

9. Install strainer before entering system and steam trap. Connect to steam and condensate return mains.

10. Wire (electric) or install control tubing (pneumatic) to the valve actuator.

11. Industry standards recommend the use of drain pans under the steam distributor.

12. Nortec recommends the use of a temperature switch. Valve will not open until the distributor has reached it's operating temperature. This is optional and must be ordered.

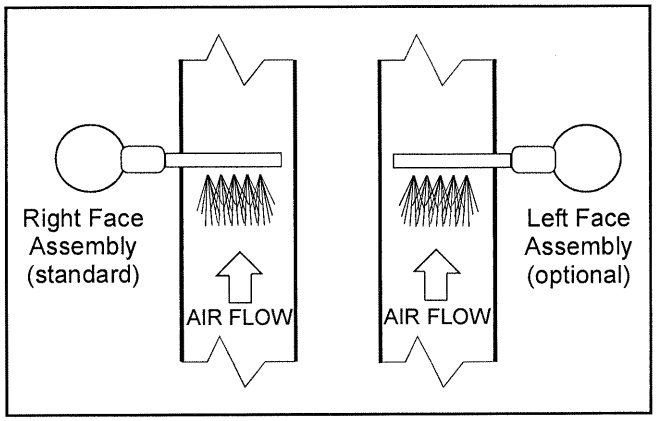
13. Nortec recommends the use of an air proving switch to prevent wetting in the duct. Humidifier will not operate if there is no air movement in the duct.

14. A high limit duct humidistat, which prevents saturation and wetting in the duct, is recommended down stream 12-14 feet from the humidifier and set at 80 to 90% RH.

CHANGING ORIENTATION OF SINGLE DISTRIBUTOR HUMIDIFIER

Unless specified otherwise in the order right face assembly of single distributor will be shipped (See Figure #10). Steam outlets should face the air stream. Should you need to correct the steam flow direction, open the union and disengage the nipple/elbow assembly from the steam distributor. Turn the tube assembly 180°. Reinstall the nipple/elbow assembly.

Figure #10



INSULATED STEAM DISTRIBUTORS

When the steam distributor is insulated the distributor should discharge in the direction of air flow. This is to prevent condensation build-up on the steel insulation jacket.

DUCT SUPPORT BRACKET

Duct support bracket allows for easy installation in the various duct configurations (Figure #11,12,13,14).

It is designed to be used with maximum bolt size of 3/8" (M10). LS1 and LS2 distributors that are 12" (30.5 cm) long are not supplied with duct support brackets.

Figure #11

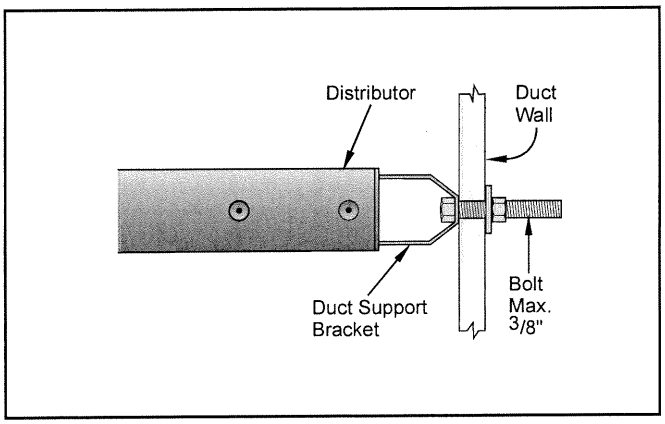


Figure #12

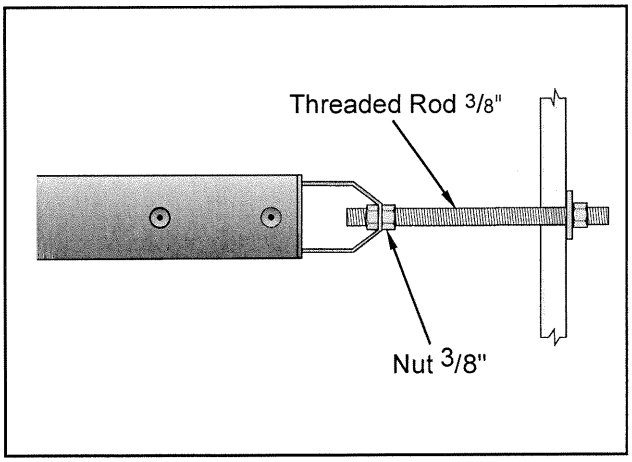


Figure #13

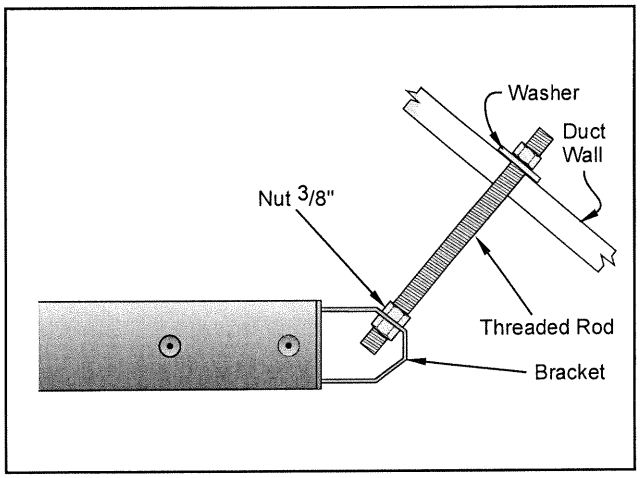
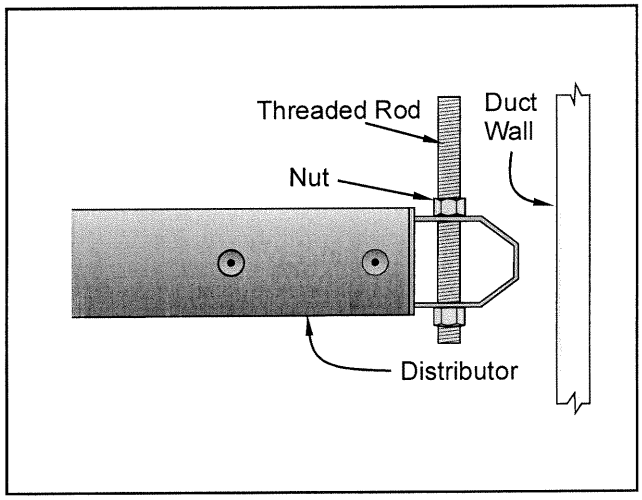


Figure #14



PRESSURIZED SAM-e

PLUMBING

Steam Line

Warning: Proper design and sizing of stem lines should be performed by a qualified technician.

Condensate Return Line

- When pressurized steam (2-50 psi) enters the SAM-e, a large pressure drop brings it down to almost atmospheric pressure. Therefore condensate can not be lifted after the F+T trap. A high temperature condensate pump may be used to achieve this.
- Condensate from the SAM-e must always be returned to an atmospheric condensate return main.
- Long condensate runs (more than 20 ft.) should be oversized for better flow.
- Refer to page 13, Figure #15 for proper trap installation.

INSTALLING ACTUATOR TO STEAM VALVE

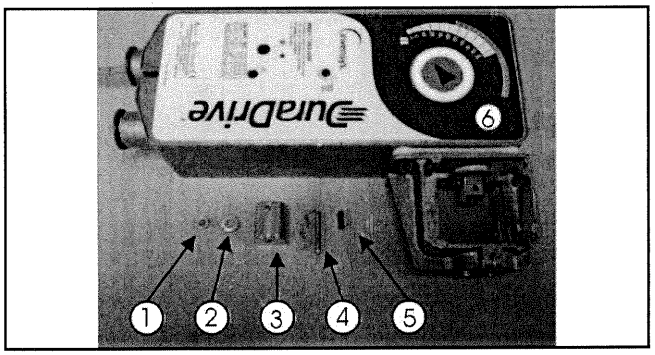
MS51-7203 DURA DRIVE ACTUATOR NORTEC PN: 150 7552 0-10VDC, 150 7553 4-20mA, 150 7554 On/Off

ASSEMBLY INSTRUCTIONS For 2" Bronze Valve, for incoming pressures from 32 to 50 psi

STEP 1

Ensure all components are accounted for:
1. Jam Nut
2. Lock Washer
3. Stem Extension
4. Connecting Pin
5. Set Screw
6. Actuator

Step #1



STEP 2

1. Thread jam nut on to valve stem all the way.

2. Place lock washer over valve stem so that it seats against jam nut.

3. Thread stem extension on valve stem compressing the lock washer.

Step #2

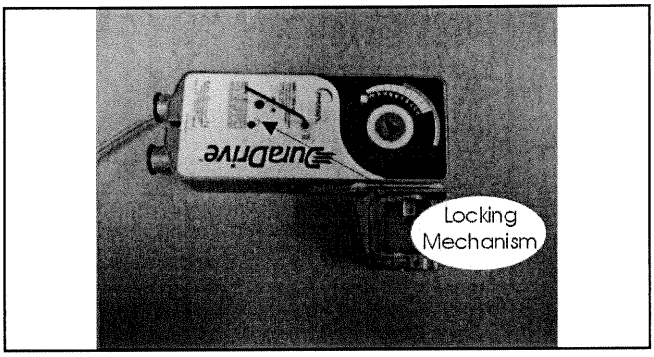
STEP 3

1. Insert hex wrench as illustrated.

2. Rotate wrench 1 ½ turns counter-clockwise.

3. Lock actuator by tightening locking mechanism with a slotted screwdriver.

Step #3



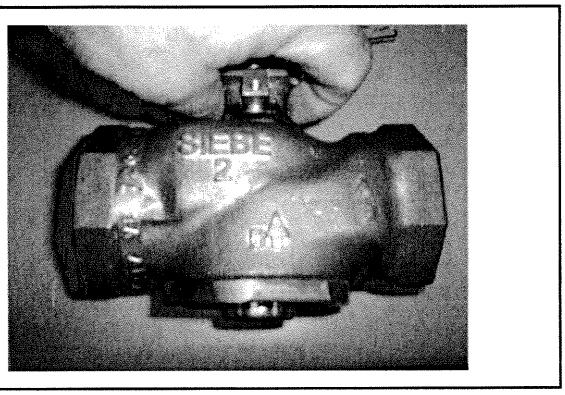
STEP 4

1. Thread actuator on to valve.

2. Tighten valve mounting nut.

3. Manually raise valve stem to up position (open).

Step #4



STEP 5

1. Align stem extension hole with actuator plunger hole.

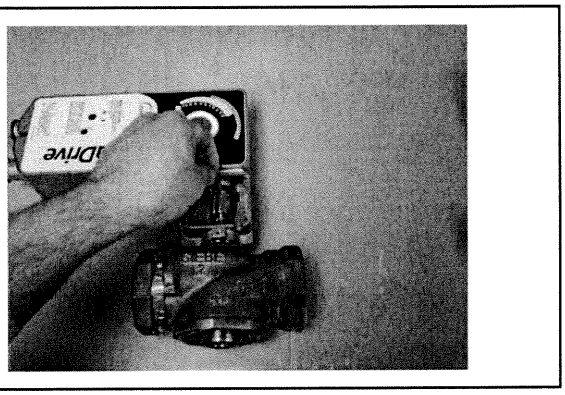
2. Insert connecting pin.

3. Tighten jam nut against valve stem.

4. Insert set screw into actuator on most accessible side.

5. Tighten 20-25 in./lbs.

Step #5



STEP 6

1. Release actuator by loosening locking mechanism.

2. Refer to wiring diagram for wiring instructions.

3. Apply power to actuator and ensure proper operation of valve and actuator.

4. Ensure proper response to control signal.

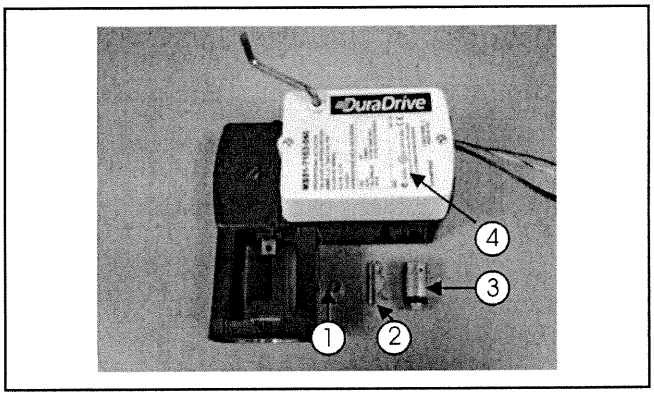
MS51-7103 DURA DRIVE ACTUATOR NORTEC PN: 150 7549 0-10VDC, 150 7550 4-20mA, 1507551 On/Off

ASSEMBLY INSTRUCTIONS For Bronze ½"-2" and St. St. ½"- 3/4" Valves, for incoming pressures from 2 to 50 psi for all valves except for 2" which would be 2 to 31 psi

STEP 1

Ensure all components are accounted for:
1. Jam Nut
2. Connecting pin
3. Stem Extension
4. Actuator

Step #1

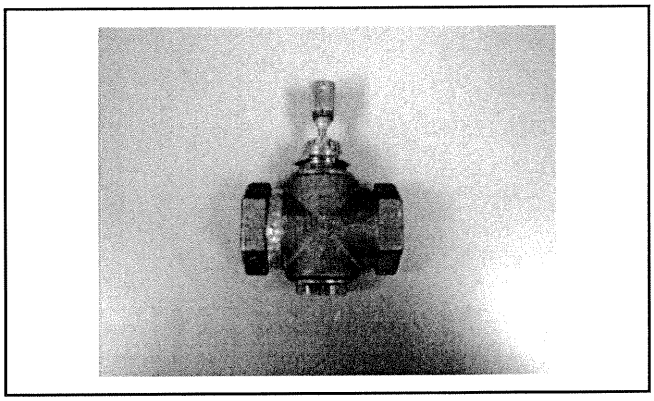


STEP 2

1. Thread jam nut on to valve stem all the way.

2. Thread stem extension on valve stem.

Step #2



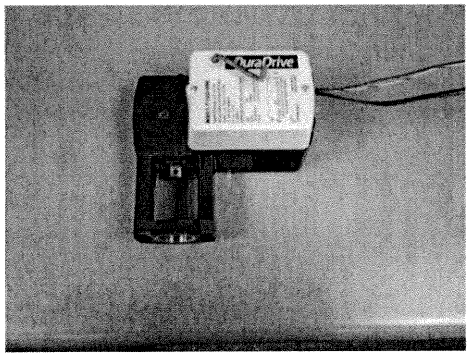
STEP 3

1. Insert hex wrench as illustrated.

2. Rotate wrench 2 turns counter-clockwise.

3. Lock actuator by pressing wrench towards actuator and rotating 1/8 turn clockwise.

Step #3



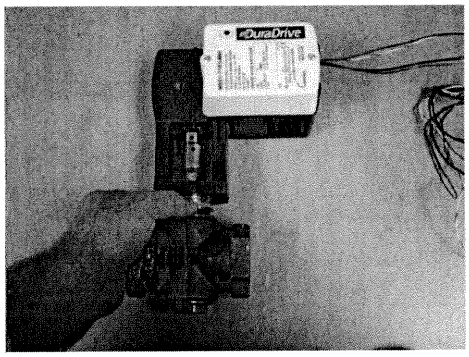
STEP 4

1. Thread actuator on to valve.

2. Tighten valve mounting nut.

3. Manually raise valve stem to up position (open).

Step #4



STEP 5

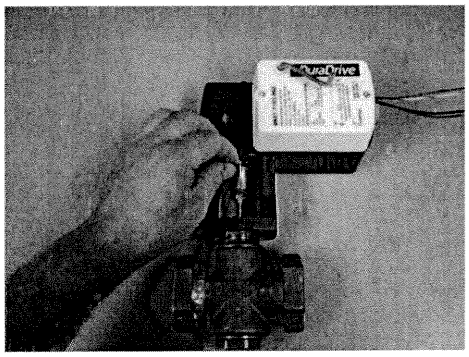
1. Align stem extension hole with actuator shaft hole.

2. Insert connecting pin.

3. Tighten jam nut against valve stem.

4. Release Actuator by turning hex key 1/8 turn counter-clockwise.

Step #5



STEP 6

1. Refer to wiring diagram for wiring instructions.

2. Apply power to actuator and ensure proper operation of valve and actuator.

3. Ensure proper response to control signal.

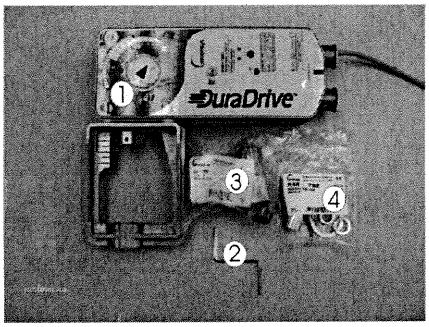
MS61-7203 DURA DRIVE ACTUATOR NORTEC PN: 150 7556 0-10VDC, 150 7557 4-20mA, 150 7558 On/Off

ASSEMBLY INSTRUCTIONS For 1"- 2" St. St. Valves, for incoming pressures from 2 to 50 psi

STEP 1

Ensure all components are accounted for:
1. Actuator
2. Hex Wrench
3. Stem Extension Kit
4. Linkage Assembly

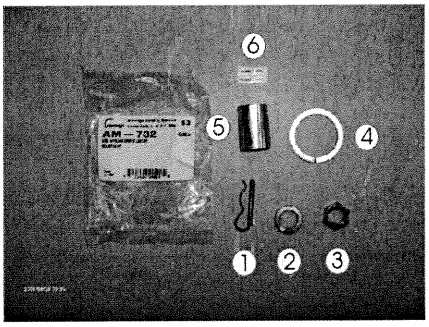
Step #1



STEP 2

Linkage Kit Includes:
1. Connecting Pin
2. Small Lock Washer
3. Nut (not used)
4. Large Lock Washer
5. Stem Extension
6. Sticker

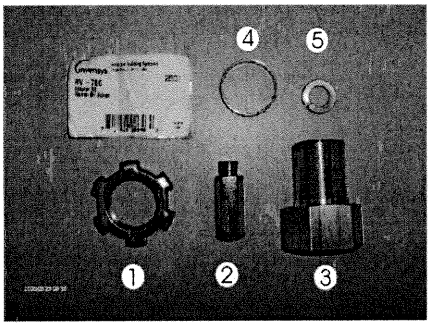
Step #2



STEP 3

Stem Extension Kit Includes:
1. Valve Mounting Nut
2. Stem Extender
3. Spacer
4. Copper Ring (not used)
5. Lock Washer

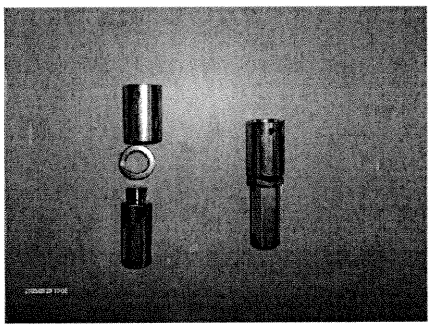
Step #3



STEP 4

1. Thread the two stem extensions together with the lock washer as shown in the illustration.

Step #4

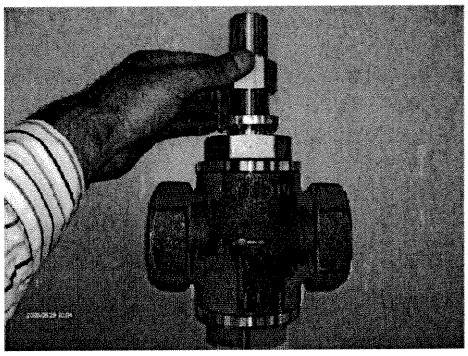


STEP 5

1. Thread the spacer on to the valve.

2. Tighten the spacer as far down as possible.

Step #5



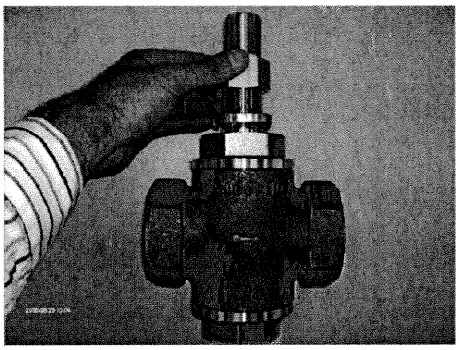
STEP 6

1. Thread Extension Assembly from Step 4 on to valve stem.

2. Hand tighten as far down as possible.

3. Manually position the valve in the fully open position.

Step #6



STEP 7

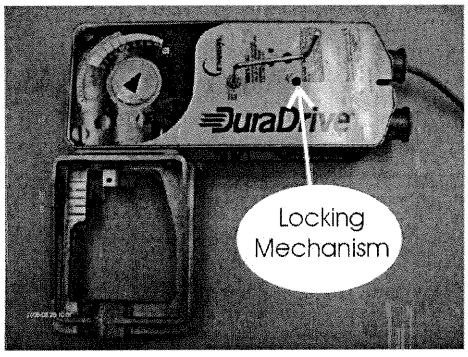
Pre-loading Actuator:

1. Insert Hex wrench as illustrated.

2. Rotate 1 ½ turns counter-clockwise.

3. Lock Actuator by turning locking mechanism clockwise with a slotted screwdriver.

Step #7



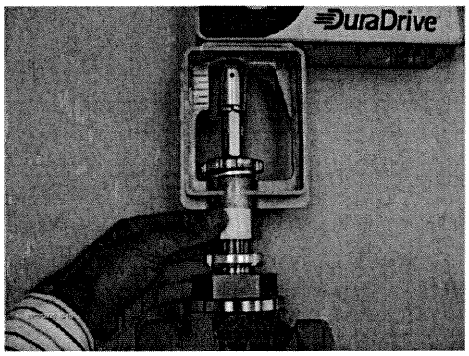
STEP 8

1. Insert valve with extension into actuator.

2. Loosely thread Valve Mounting Nut and Lock Washer on to Spacer as illustrated.

3. Adjust Stem Extension by rotating to align holes on valve stem extension and actuator.

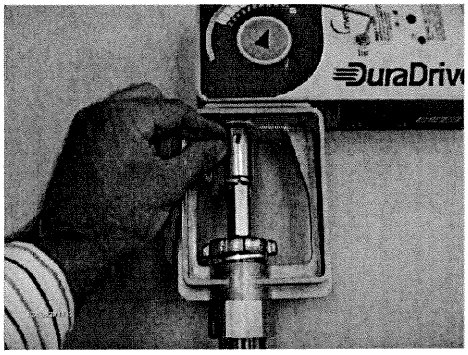
Step #8



STEP 9

1. Insert Connecting Pin through hole in Stem Extension and actuator plunger.

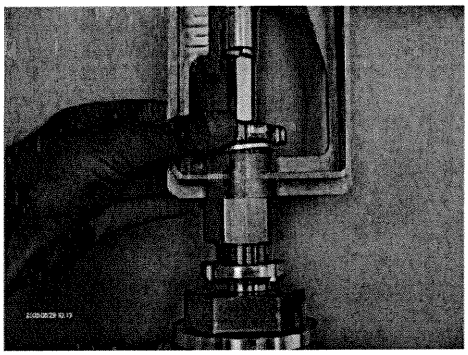
Step #9



STEP 10

1. Tighten Valve Mounting Nut compressing Lock Washer.

Step #10



2. Tighten Stainless Steel Jam Nut on actuator against the Spacer.

STEP 11

1. Release actuator by loosening locking mechanism.

2. Refer to wiring diagram for wiring instructions.

3. Apply power to actuator and ensure proper operation of valve and actuator.

4. Ensure proper response to control signal.

Figure #15
LiveSteam Actuator - Wiring Diagram

Modulation By NORTEC
LiveSteam Technology

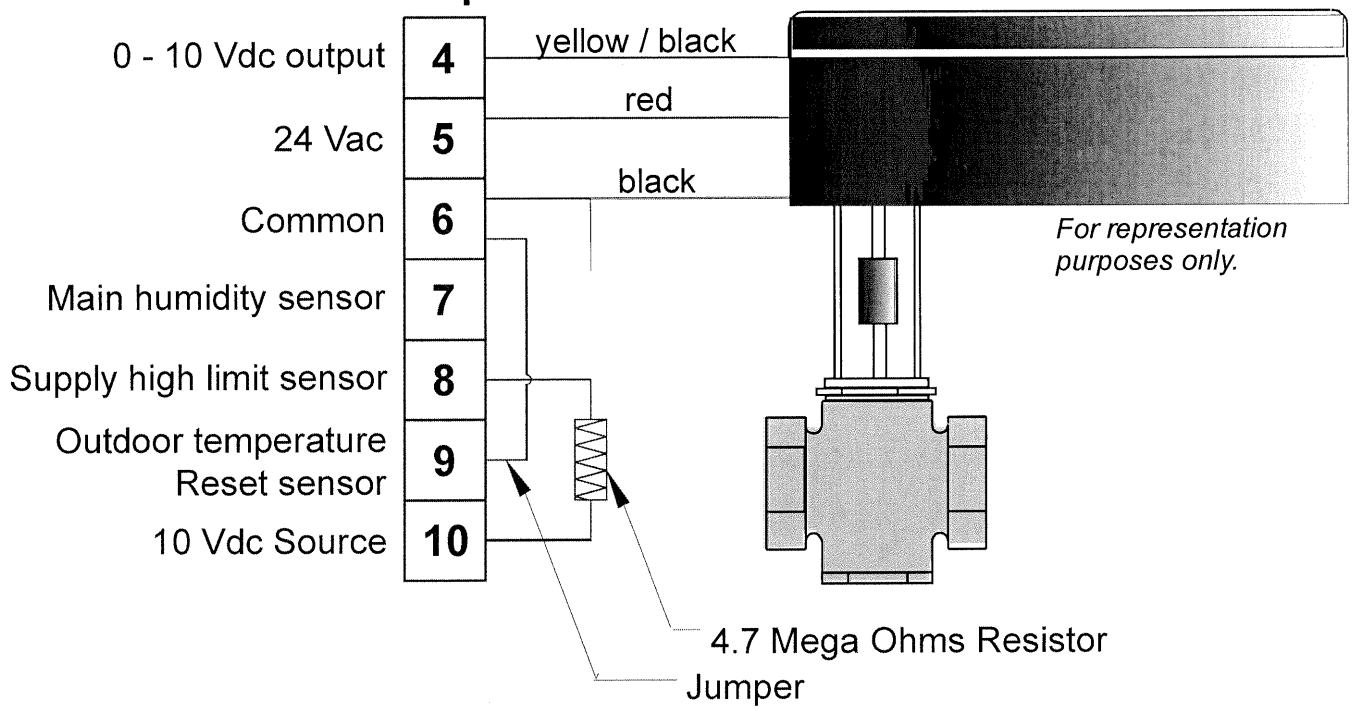
Controller - P/N 132-9131, 132-9132, 132-9133
Actuator - P/N 150-7549, 150-7552, 150-7556

WARNING: Failure to wire the humidistat in accordance with the wiring diagram could permanently damage the humidistat and / or actuator. Such errors will void warranty.

Cabling betwen humidistat controller and actuator or remote sensor should be sheilded 18 AWG.

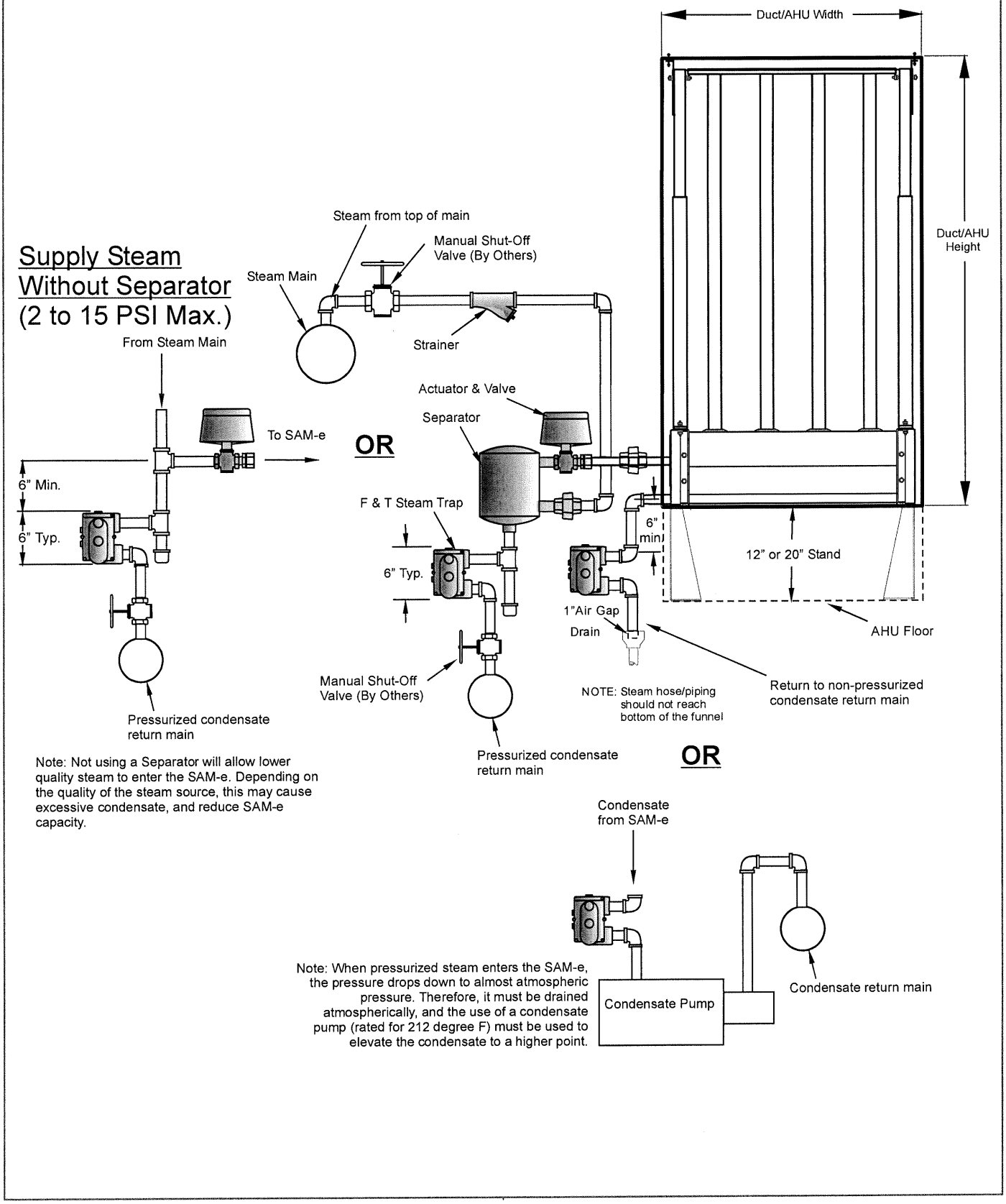
CONTROLLER TO ACTUATOR CONNECTIONS

Controller terminal strip



NOTE: For options (8) supply high limit sensor and (9) outdoor temperature reset sensor, please see wiring diagram that comes with the controller.

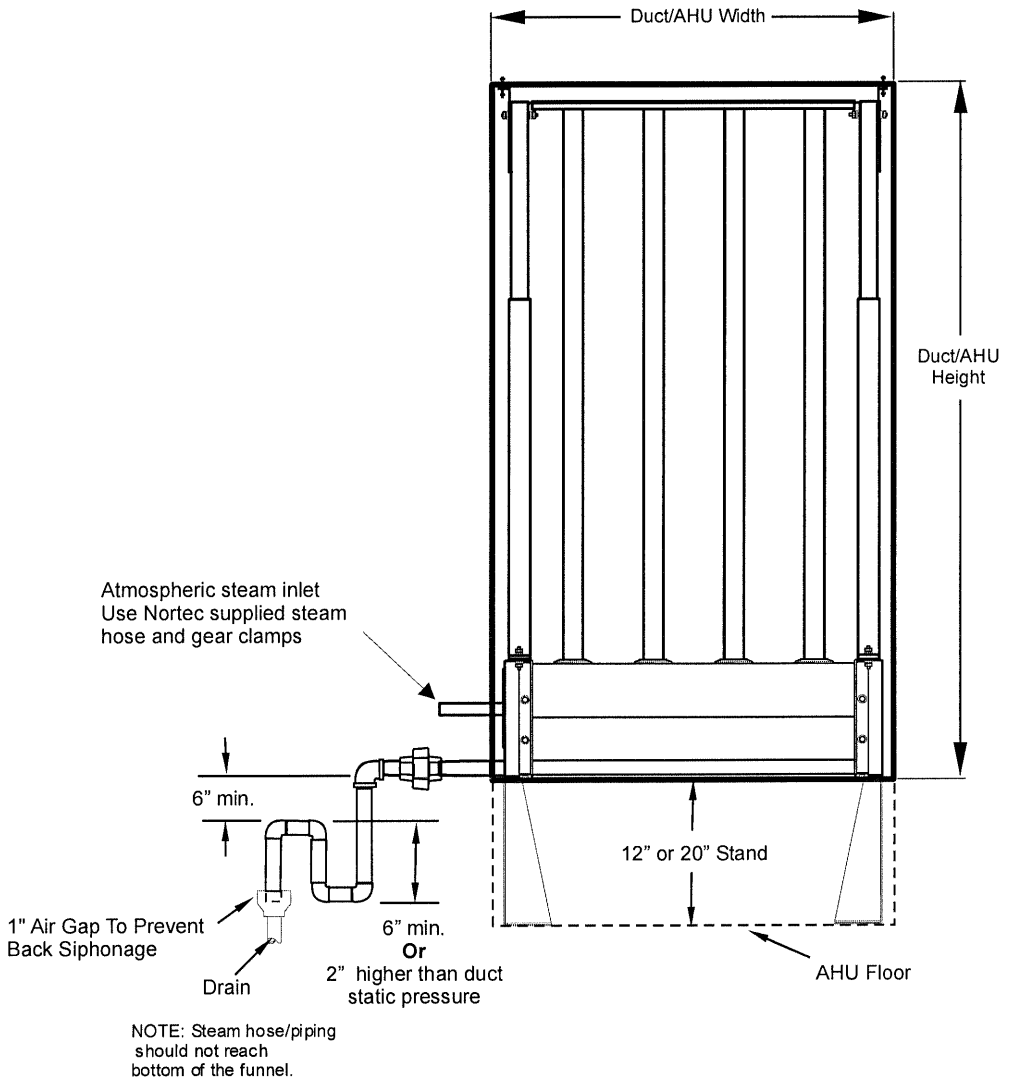
Figure #16
Typical SAM-e Installation for Pressurized Steam Applications



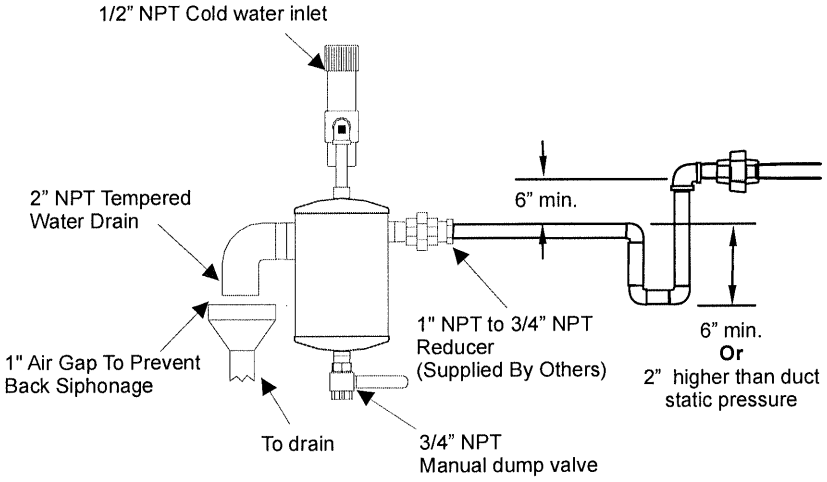
Note: Not using a Separator will allow lower quality steam to enter the SAM-e. Depending on the quality of the steam source, this may cause excessive condensate, and reduce SAM-e capacity.

Note: When pressurized steam enters the SAM-e, the pressure drops down to almost atmospheric pressure. Therefore, it must be drained atmospherically, and the use of a condensate pump (rated for 212 degree F) must be used to elevate the condensate to a higher point.

Figure #17
Typical SAM-e Installation for Atmospheric Steam Applications



Drain Water Cooler Option:



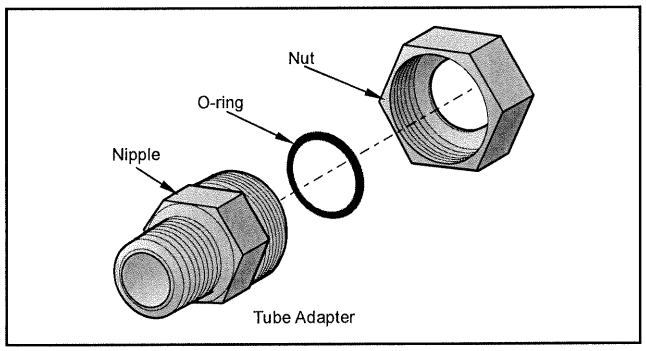
MAINTENANCE

ELEMENTS OF LIVESTEAM HUMIDIFIER

Tube Adapter - consists of 3 pieces (See Figure #18). To maintain proper seal hand tighten tube adapter nut, plus ¼ turn. Additional o-ring is shipped with this manual. If o-ring has to be replaced do so as follows:

1. Disconnect actuator.
2. Dismount union by the separator.
3. Replace o-ring in the tube adapter.
4. Lubricate o-ring with silicone based lubricant.

Figure #18



Strainer - Should be cleaned shortly after the system has begun operating (3 to 7 days) and then annually.

Separator - No maintenance required.

Distributor - No maintenance required.

Valve - Should be inspected annually to confirm that steam is not leaking from the stem packing, and the valve closes tightly. Repack if necessary.

Valve Seat - Lap seat if necessary.

Pneumatic Actuator - Should be inspected annually to confirm that the diaphragm is not leaking air, and the valve operates properly.

Electric Actuator - Should be inspected annually to confirm that the valve operates properly.

Steam Trap - Should be inspected annually. Clean and inspect seats and replace required gaskets if necessary.

Temperature Switch - Should be inspected once a year to ensure proper operation. Test by supplying steam, which should open at 200°F.

MAINTENANCE SCHEDULE

DATE	PERSONNEL	DESCRIPTION

TROUBLESHOOTING GUIDE

PROBLEM	CAUSE/SOLUTION
Distributor Discharges Water	Condensate return line not draining: 1) Back pressure on condensate line. 2) Dirty steam trap - repair or replace. 3) Steam trap is wrong type. Steam supply: 1) Steam pressure is too low (under 2 psi). 2) Steam main flooding due to boiler discharging water with steam. 3) Steam supply not taken at top of main. 4) Distributor not level.
Humidifier Leaks Water From Tube Adapter	1) Tighten tube adaptor. 2) Defective o-ring in tube adapter - replace o-ring. 3) Is the o-ring lubricated?
Over Humidifying	1) Valve stem adjusted too tight and sticking. 2) Valve spring broken. 3) Foreign matter is preventing the valve from closing. 4) Valve is installed incorrectly. 5) Steam pressure exceeds rating of valve spring. 6) Controller out of calibration.
Under Humidifying	1) Boiler pressure is inadequate. 2) Steam piping is either undersized or piped incorrectly. 3) Strainer is plugged. 4) Valve is not fully opened. (Check for leaking air in actuator.) 5) Humidifier is undersized. 6) Controller is out of calibration. 7) Excess amounts of outside air. 8) Open doors, window, loading / shipping docks.
Humidity Swings	1) Controller is malfunctioning. 2) Poor location of humidity sensor. 3) Humidifier is oversized. 4) Boiler pressure swings too widely. 5) Pressure reducing valve is not working properly (if installed).
Spitting During Start-Up	1) Add temperature switch. 2) Are drip legs installed? 3) Was the piping supplied undersized? 4) Is the boiler carrying too much condensate? 5) Is the boiler undersized of does it have the incorrect pressure?
Condensate In Duct	1) Mounting too close to devices (elbows, dampers, etc.) in duct. 2) Duct surface temperature is too low. 3) Oversized humidifier. 4) Malfunctioning or lack of safety high limit humidistat.

LIMITED WARRANTY

AXAIR NORTEC INCORPORATED and/or AXAIR NORTEC LIMITED (here in after collectively referred to as THE COMPANY), warrant for a period of two years from date of shipment, that THE COMPANY's manufactured and assembled products, not otherwise expressly warranted, are free from defects in material and workmanship. No warranty is made against corrosion, deterioration, or suitability of substituted materials used as a result of compliance with government regulations.

THE COMPANY's obligations and liabilities under this warranty are limited to furnishing replacement parts to the customer, F.O.B. THE COMPANY's factory, providing the defective part(s) is returned freight prepaid by the customer. Parts used for repairs are warranted for the balance of the term of the warranty on the original humidifier or 90 days, whichever is longer.

The warranties set forth herein are in lieu of all other warranties expressed or implied by law. No liability whatsoever shall be attached to THE COMPANY until said products have been paid for in full and then said liability shall be limited to the original purchase price for the product. Any further warranty must be in writing, signed by an officer of THE COMPANY.

THE COMPANY's limited warranty on accessories, not of NORTEC's manufacture, such as controls, humidistats, pumps, etc. is limited to the warranty of the original equipment manufacturer from date of original shipment of humidifier.

THE COMPANY makes no warranty and assumes no liability unless the equipment is installed in strict accordance with a copy of the catalog and installation manual in effect at the date of purchase and by a contractor approved by THE COMPANY to install such equipment.

THE COMPANY makes no warranty and assumes no liability whatsoever for consequential damage or damage resulting directly from misapplication, incorrect sizing or lack of proper maintenance of the equipment.

THE COMPANY retains the right to change the design, specification and performance criteria of its products without notice or obligation.

AxAir Nortec

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